Border Router Discovery Protocol (BRDP) Based Routing
draft-boot-brdp-based-routing-00.txt

Abstract

This document specifies a mechanism for routing in multi-homed edge networks. The default gateway routing mechanism is replaced with routing to Border Routers that correspond with the source address of the packets.
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1. Introduction

With the growth of the Internet, the routing table in the Internet Default Free Zone (DFZ) is becoming unacceptably large. One of the reasons is usage of Provider Independent (PI) Address blocks in edge networks. A remedy is encouragement of Provider Aggregatable (PA) Addresses. Unfortunately, PA addresses and multi-homing may introduce some problems if not carefully planned and configured [RFC3704].

In a stable network, multi-homing with PA addresses can be supported by configuring routing, tunneling, filtering or other mechanisms. In a more dynamic world, this is less practical and needs improvement. In a MANET [RFC2501], manual configuration is infeasible.

The Border Router Discovery Protocol (BRDP) [I-D.boot-autoconf-brdp] provides a mechanism for Address Autoconfiguration in ad hoc networks and may support automatic renumbering. In addition, a mechanism is needed for ensuring that traffic is directed to a Border Router that corresponds with the source address. This will circumvent problems with ingress filtering, as described in [RFC5220] section 2.1.2.

BRDP Based Routing provides a mechanism for packet delivery to Border Routers that correspond with the source addresses of the packets. This mechanism is applied for traffic that is not destined for interior nodes of the edge network. It replaces the default route mechanism.

The BRDP Based Routing mechanism also provides basic support for load distribution over multiple Border Routers. More advanced load balancing can be provided for multi-homed hosts, provisioned with transport layer facilities that utilize multi-homing.

2. Problems with default gateway routing

Usually, the nexthop selection is based on the destination address. In case of default gateway routing and multiple exit routers to multiple providers, the source has no influence on what exit router is used. In case of ingress filtering and lack of a mechanism to redirect packets to exit routers that correspond to the source address, packets may be dropped.

This default gateway routing behavior blocks incremental enhancement of the Internet, e.g. through the addition of support for more dynamic networks and / or host based load distribution mechanisms. In a MANET, it also also prevents the use of make-before-break [RFC3753] mechanisms.
3. Default gateway routing replaced with BRDP Based Routing

Default gateway based routing for IPv4 is defined in [RFC1812], section 5.2.4.3:

(5) Default Route: This is a route to all networks for which there are no explicit routes. It is by definition the route whose prefix length is zero.

With BRDP Based Routing, another type of route is introduced:

(6) BRDP Route: This is a route to all networks for which there are no explicit routes, and a default route is not used. The nexthop IP address is found by means of a Border Router Information Cache (BRIO-Cache) lookup based on the source address and, if a matching BRIO-Cache entry is found, a subsequent FIB lookup based on the selected Border Router address.

Note that route types (3) and (4) are not defined in RFC1812.

BRDP Based Routing can be turned on and off with the existence of a default route in the IGP. This switch function might be useful in migration scenarios towards BRDP Based Routing.

The Border Router should run the IGP on the interface with the BRDP advertized Border Router address.

In the edge network, all interior routers should run BRDP and BRDP Based Routing. All interior routers will have a BRIO-Cache [I-D.boot-autoconf-brdp] with information for selecting Border Routers as exit points to the Internet. A BRIO-Cache entry contains a Border Router address and a summary prefix assigned to that Border Router. BRIO-Cache lookup follows the longest-match rule.

Forwarding is solely based on FIB lookups, the nexthop IP address is found either by a FIB lookup with the destination address or by a FIB lookup with the address of the Border Router that corresponds with the source address. If the nexthop IP address lookup fails, the packet is discarded.
4. Support for IPv4

BRDP-based Address Autoconfiguration is designed for IP version 6. Support for IP version 4 will be taken into consideration.

5. IANA considerations

This document has no actions for IANA.

6. Security Considerations

BRDP Based Routing depends on BRDP and the IGP used. BRDP depends on security mechanisms provided by ND [RFC4861]. ND can be secured by SeND [RFC3971]. IGPs are assumed to have their own security mechanisms.

More research on security issues for BRDP Based Routing is needed.

7. Acknowledgments

BRDP is inspired by MANEMO technology; thanks to all who contributed to it. Thanks to Ran Atkinson, who guided me towards a BRDP Based Routing mechanism that does not rely on routing headers or encapsulation. And thanks to Ronald in ’t Velt for reviewing.

8. References

8.1. Normative References


8.2. Informative References


Appendix A. Change Log From Previous Version

- 00: Initial Document.

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